REMARKS:

Claims 1-9 are pending in the application. Claims 8-9 are withdrawn. Claim 1 is independent. New claims 10-16 are presented. No new matter is added. No claims are amended or cancelled in this reply. Applicants respectfully request reconsideration of the present application.

Amendment of Specification

The Examiner requested correction of the amendment to the specification requested in Applicants' response dated October 26, 2006. Applicants regret that the instructions did not unambiguously identify the correct paragraph. As noted by the Examiner, the text to be amended also corresponds to paragraph [0010] of the application as originally filed. The prior instructions pertained to the paragraph number as enumerated in Patent Application Publication No. 2006/0102315, the publication of the present application. Applicants believe that the present request for amendment conforms to the Examiner's requirements.

Rejection under 35 U.S.C. § 112, first paragraph

Claims 1-7 were rejected as failing to comply with the enablement requirement of 35 U.S.C. § 112, first paragraph. Applicants respectfully traverse the rejection because the description enables one of skill in the art to make and use the claimed invention without undue experimentation and, furthermore, the Office has not established a reasonable basis to question the enablement and has therefore not met its burden. See MPEP § 2164.04. It is contended in the Office Action that "not all the existing alloys can form the amorphous structure by casting in the twin roll caster" and that "it is not known what existing amorphous alloys will form the amorphous structure with the claimed process parameters." The Office Action cites paragraph [0028] of the specification, stating that "it simply discloses that the specific copper alloy" will produce the amorphous structure, while the "claims encompass all the existing alloys." Applicants disagree with both statements; paragraph [0028] actually

teaches a range of exemplary Cu-based alloys and the claims do not encompass all existing alloys. Because the claims recite "cooling the melt at a cooling rate higher than the critical cooling rate for transformation of the melt into an amorphous solid phase," the alloy, whose components are contained in the melt, must be capable of an amorphous solid phase and must have a critical cooling rate. As stated in paragraph [0050] of the specification, there are no particular limitations on alloy compositions to be used in the present invention. Paragraph [0050] also enumerates seven exemplary Cu- and Zr-based alloys. See also Declaration of Nack Joon Kim, ("Declaration") paragraphs 14-15 (describing the breadth of teaching provided by the present application and describing published works describing bulk alloys made in accordance with the present invention, from a variety of alloys). The Office Action cites no evidence or facts which would lead to the conclusion that one of ordinary skill in the art would not be able to make and use the invention with Cu-based alloys, Zr-based alloys, and other alloys capable of an amorphous solid phase without undue experimentation.

It appears, based on the Office Action and the telephone call initiated by the Examiner with the undersigned in December 2006, in which the Examiner proposed limiting the claims to copper alloys, that the Office is contending that the claims are enabled only to the scope of the example cited by the Office. However, an enablement rejection based on such a contention must, in view of facts and evidence, state why one would not expect to be able to extrapolate that one example across the entire scope of the claims. MPEP § 2164.02. The Office Action does not so state and is therefore improper. (Though citing this portion of the MPEP, Applicants are not conceding that the range of alloys recited in paragraph [0028] comprise the only exemplary alloys disclosed in the application.)

Because the specification enables one of skill in the art to make and use the claimed invention without undue experimentation (as evidenced by the Declaration; see also paragraph [0029]) and because the Office has not even met its burden of showing a

reasonable basis to question the enablement—based upon facts and evidence as required by the examining procedure—the rejection is improper and Applicants request that it be withdrawn.

Rejection under 35 U.S.C. § 103(a)

Claims 1-7 were rejected as being obvious under 35 U.S.C. § 103(a) over either U.S. Pat. No. 4,212,344 to Uedaira et al. (Uedaira), JP 60-248,854 ('854), or JP 55-73,448 ('448) in further view of U.S. Pat. Appl. Pub. No. 2002/0142182 by Peker et al. (Peker). Applicants respectfully submit that the Office Action fails to establish a *prima facie* case of obviousness. All claim limitations are not taught or suggested by the references. See, generally, MPEP § 2143.03. It is conceded in the Office Action that the references cited in the prior Office Action, Uedaira, '854, and '448, fail to show "the rotation speed of the rolls, the gap of the nip, the melt temperature and surface temperature of the rolls" as claimed. Peker, newly cited, does not correct the deficiency. The rejection is improper because the combination of references cited by the Examiner does not disclose, teach, or suggest all of the methods and limitations of the claimed invention.

For example, none of the references disclose, teach, or suggest that "the rotation rate of the two rolls is in the range of 1 to 10 cm/sec" as claimed in the present invention. Uedaira and the abstract of '854 disclose high speed rotational rates which not only fail to disclose 1 to 10 cm/sec, but actually teach away by orders of magnitude. For example, '854 discloses a rotational rate of 3,000 rpm and roll outer diameter of 200mm. Conversion of this rate from revolutions per minute to centimeters per second yields about 3,142 cm/sec ($\cong \pi \times$ 200 mm × 3,000 rpm ÷ 60 sec/m ÷ 10 mm/cm). Uedaira discloses rotational rates of 1,450 rpm and 2,850 rpm with 15 cm roll diameters, which may be converted likewise to linear rates of approximately 1,139 cm/sec and 2,238 cm/sec, respectively. As noted in Applicants' prior response and supported in the specification and cited paper, such excess rates will fail to

produce the claimed bulk amorphous alloy sheet. See also, Declaration, paragraphs 16-20 (explaining that the cited references do not teach or suggest the claimed thickness (gap) range or the claimed rotations rates). Peker does not disclose rolls and therefore does not disclose a rotation rate of rolls.

The Office Action also does not point to any reference which teaches or suggests "cooling the melt at a cooling rate higher than the critical cooling rate for transformation of the melt into an amorphous solid phase, when the melt passes through the gap defined between the two rolls" as claimed in the present invention. Reference '854 claims a cooling roll. Reference '448 discloses a melt spouting method. Uedaira, disclosing a method of manufacturing an amorphous alloy (Abstract), does not disclose the use of the critical cooling rate for transformation of the melt into an amorphous solid phase, much less, when the melt passes through the gap defined between the two rolls. Rather, Uedaira teaches that roll pressure is a function of crystallization temperature.

None of the references teach or suggest two rolls, "each of which is provided with heat exchange means." In contrast, Uedaira teaches away from the claimed configuration by teaching auxiliary cooling means such as air jets and a water bath. See Uedaira Fig. 1, refs. 5, 6, and 8.

The Office Action relies on Peker for a disclosure of "1.0 mm or thicker amorphous alloy with a cooling rate as low as 500K/sec or less," contending that "[i]t would have been obvious to cast [] a thicker amorphous alloy in the process of the primary references by using the alloy composition of Peker et al." This contention is incorrect. Peker relates to sharp-edged cutting tools and a method of manufacturing sharp-edged cutting tools wherein at least a portion of the sharp-edged cutting tool is formed from a bulk amorphous alloy material. Abstract; Declaration, paragraph 19. Peker teaches away from a combination with Uedaira, '854, and '448 for the very reasons that the Office contends that one of skill in the art would

be motivated to refer to them. Peker teaches that bulk solidifying amorphous alloys that can be cooled at cooling rates of 500K/sec or less are preferable because they can be produced in thicknesses of 1 mm, "substantially thicker than conventional amorphous alloys having a typical cast thickness of 0.020 mm." Paragraph [0020] (emphasis added). Uedaira and '854 disclose the typical cast thickness of 0.020 mm and do not disclose thicknesses of 1 mm ('448 does not disclose dimensions). Thus, a person of skill in the art reading Peker paragraph [0020] would not look to Uedaira, '854, or '448, but rather would refer to Peker paragraph [0031] which enumerates methods of manufacture including molding and casting. The only casting process actually taught by Peker is that of die casting, and then, only by incorporation by reference of U.S. Pat. No. 5,711,363. Thus, one of skill in the art, seeking 1 mm thickness and relying on Peker, would utilize the die casting method disclosed in U.S. Pat. No. 5,711,363 or one of the molding methods further enumerated in paragraph [0031]. See Declaration, paragraph 19.

Additionally, the Office asserts without support that "[i]t is apparent that as the thicker strip is cast in the twin roll process the rotation speed of the rolls must be reduced to solidify enough thickness of thin shells before the strip leaving the roll nip region and thereby to avoid rupture of shell from occurring." The Office is either impermissibly using the teachings of the present application to support an obviousness rejection (see MPEP § 2142) or is impermissibly extrapolating knowledge of the manufacture of conventional crystalline alloy sheets to the manufacture of bulk amorphous alloy sheets. There is no basis for the extrapolation implied by the Office. See, e.g., Declaration, paragraph 21. One of skill in the art would not have expected that bulk amorphous alloy sheets could be made by reducing the rotation rate of the rolls. See, e.g., Declaration, paragraph 22. Furthermore, the present claims recite "cooling the melt at a cooling rate higher than the critical cooling rate for transformation of the melt into an amorphous solid phase, when the melt passes through the

gap defined between the two rolls." As exemplified in the attached articles, if the rate is lower than the minimum rate claimed, the temperature of the alloy may be lower than the glass transition temperature and cause the rolls to stop. If the rotation rate is higher than the maximum claimed rate, the temperature of the alloy may be exceed the liquidus temperature at the nip and a bulk amorphous alloy sheet cannot be formed at all.

In sum, the references do not disclose all of the elements of claims 1-7, there is no motivation to combine Peker with Uedaira, '854, or '448, and it would not have been obvious to modify Uedaira, '854, or '448 by both reducing the rate of rotation thousands-fold or multiplying the casting thickness 50-fold in order to achieve the claimed invention. For at least the foregoing reasons, the present claims are patentable over the cited references and Applicants request that the rejection be withdrawn.

New Claims

New claims 10-16 find support in claim 1 from which they depend either directly or through an intermediate claim and in, for example, paragraph 50 of the specification. New claims 10-16 are patentable over the cited art at least due to their dependency on patentable claim 1. For example, none of the cited art references disclose a "rotation rate of the two rolls is in the range of 1 to 10 cm/sec, and the gap between the two rolls is in the range of 0.5 to 20mm" as claimed.

Conclusion

All of the stated grounds of rejection have been properly traversed. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections, and that they be withdrawn. Applicants believe that a full and complete reply has been made to the outstanding Office Action and, as such, the present application is in condition for allowance.

If the Examiner believes that a telephone conference or personal interview would

expedite passage of this application to issue, the Examiner is invited to call the undersigned at the number below.

If any extension of time is required in connection with the filing of this paper and has not been requested separately, such extension is hereby requested.

The Commissioner is hereby authorized to charge any fees and to credit any overpayments that may be required by this paper under 37 C.F.R. §§ 1.16 and 1.17 to Deposit Account No. 02-2135.

Respectfully submitted,

Date: July 11, 2007 By _____

Richard Wydeven
Attorney for Applicants
Registration No. 39,881
ROTHWELL, FIGG, ERNST & MANBECK, p.c.
Suite 800, 1425 K Street, N.W.
Washington, D.C. 20005
Telephone: (202)783-6040